S.N. 09/929,849

Attorney Docket No. 2001-0128.00
(56202.US/4665.0)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Brian C. Hart et al.
Application No.:	09/929,849
Filing Date:	August 14, 2001
Confirmation No.:	9848
Title:	METHOD FOR MAKING INKJET PRINTHEADS
Examiner:	R. P. Culbert
Group Art Unit:	1763

DECLARATION OF SHAUNA M. LEIS UNDER 37 C.F.R. §1.131

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I, Shauna M. Leis, declare that:

1. I am over 18 years of age and one of the named co-inventors in the U.S. patent application identified above and I make this declaration based upon personal knowledge of the facts stated herein.

2. I am currently employed by the assignee, Lexmark International, Inc., in Lexington, Kentucky as a Chemical engineer.

3. I graduated in 1997 from the University of Louisville with a B.S. degree in Chemical Engineering and obtained an M.Eng in Chemical Engineering from the University of Louisville in 1998.

4. I am intimately familiar with the above referenced application, the office actions dated October 29, 2002, and January 13, 2003, and, in particular, with U.S. Patent No. 6,402,301 to Powers et al. relating to ink jet printheads and methods for making printheads.

5. Prior to October 27, 2000, the invention was conceived as described and claimed in Claims 1-18 of the above reference application in this country as evidenced by Invention Disclosure No. 0239 signed by me, Brian C. Hart and Gary R. Williams, and witnessed by G. Patil and Colin Maher. All of the dates redacted from the invention disclosure were before October 27, 2000, the filing date of the '301 patent.

6. As further evidence of the reduction to practice of the invention, I am attaching copies of my relevant notebook pages. As shown by the attached pages, wafers were coated on two different dates with polyacrylamide (PAM) and polyethylene oxide (PEO) before grit blasting or etching the wafers with reactive ion etching (RIE). Each of the wafers contained a water insoluble photoresist layer referred to as LEXFILM. The PAM was a 50 wt. % solution in water that was spun coated onto the wafer at 1500 rpm for 30 seconds. The PEO was coated onto the wafer from a 7 wt.% solution of PEO. The PEO was found to protect the wafer well and remove cleanly after grit blasting the wafer. The dates redacted from the page marked 1 were before October 27, 2000. Wafers coated with PEO from a 7 wt.% solution are shown in Figs. 1-3.

7. Less than a month later, a wafer containing a LEXFILM layer was coated with a solution made from 80 milliliters of 50 wt.% PAM in water and 10 mL of water, then the wafer was grit blasted. There was a 3% yield improvement using the PAM coating to protect the wafer. The date redacted from the page marked 2 was also before October 27, 2000.

8. Before October 27, 2000, wafer coating experiments were conducted as set forth on the notebook page marked 3. In these experiments, each wafer contained a

LEXFILM layer. The wafers were plasma cleaned at 100 watts for 30 seconds. Water soluble layers were then spun coated at 1400 rpm for 20 seconds from a 50 wt.% solution, a 25 wt.% solution, a 12 wt.% solution, and a 6 wt.% solution of PAM in water. The corresponding coating layer thicknesses were 25-27 microns for the 50 wt.% solution, 20 microns for the 25 wt.% solution, and 10 microns for the 12 wt.% solution.

9. On the notebook page marked 4, wafers containing a LEXFILM layer were coated with 7 wt. % PEO less than two months after October 27, 2000. The PEO had a molecular weight of 400,000. The first wafer was spun-coated at 1000 rpm for 60 seconds and had a coating thickness of 10 microns. The second wafer was spun-coated at 750 rpm for 60 seconds and had a coating thickness of 13 microns. A wafer coated with 7 wt.% PEO after grit blasting and RIE etching is shown in Fig. 4. In this figure, the PEO coating has already been removed with water after the process was completed.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: 02/05/03

Shauna M. Leis

Shauna M. Leis

C:\Draft\toTice actions\56202dec.doc

(1)

Coating wafers w/ 50/50 PAM w/ 4 drops Triton XL-80N splotchy in blank water
at 1500 rpm ; 20 sec
still splotchy

Talked w/ Brad Heath - he's suggested using material called Silwet as surfactant at 0.1% or try hexane diol at 5%.

to get 0.1% $\frac{x}{75\,mL} = 0.001 \Rightarrow x =$

$\frac{x}{75\,mL} = 0.05 \Rightarrow x = 3.75\,mL$

Coated maple veneer w/ 7% PEO coating to protect during grit blast and then RIE
protected well and removed cleanly after grit blast
difficult to inspect after grit blast through coating ; look into more optics for inspection tool

Coating appeared thin though, try larger molecular weight PEO

(2)

To coat yellowstone wafer - used 80 mL PAM 50/50
10 mL water (2 drops of hexanediol)

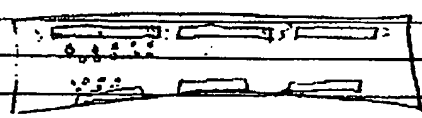
Then sent through gritblast ⇒ 32 yield improvement

TC
testing for Temp max to 150°C 25 0:20 150 04:00 100 00:30
cycle A completed, cycle B completed, cycle 2 completed
cycle E completed, cycle D could not start

for the eff.

cycle B 60 25 00:10 95.0 10:00 95.0 01:00 Valve 1 on 00:00 off 11:10
cycle C 10 25.0 00:10 95.0 09:00 95.0 01:00 Valve 1 on 00:00 off 05:10
cycle E 2 25.0 00:10 95.0 07:00 95.0 01:00 Valve 1 on 00:00 off 08:10
cycle A is Dab

ran cycle A - approximately 10°C difference from inside circle to outer circle on thermocouple wires



(3)

Buck NP/chip assemblies
ran ## in TCB at 90°C ; 40 psi
large void areas
put some in pressure vessel for cure
and some in VFM 2 min hold (90, 100, 110, 120, 150, 1?0 175 - 10 min) (0.5 day's waiting)
peel strength on VFM low at 40 g still large voids
may need to adjust for different material
(1+0.5 instead of regular 2+0.5)
final VFM temperature may be a test lot for 1+0.5
([redacted]°C)

washed at 100°C

PVA 1 - few dirty fingers
PVA 2 - same
PAM 2 - very bad
PAM 1 - not as bad, but bad
PAM 3 - very bad
PEO 2 - very bad
PEO 1 - very bad

* Wafer coating experiments
PAM MW 100 - plasma clean wafer w/ Lexfilm 100 W for 30 sec
50/50 solution at 1400 rpm and 20 sec 25-27 μm * thickest for wafer coating
15 ml PAM 32% solution at " " 20 μm
12 ml PAM 19% solution at " " 10 μm
?% solution

(4)

No phenolic adhesion wafers

Birch Low Level wafer w/ Kapton 100 HPP-ST, 100E, 100 KV

Ooh w/ Birch Low Level w/ Z-6032 ? other silane then Kapton HPP, Kapton E, Kapton KV, RIE Etch.

1 T 1% solution 100 mL reagent alcohol, 30 dpc water 1.01 g silane solution

$0.01 = \frac{0.5X}{100+X} \Rightarrow 0.01 = \frac{0.5}{100+0.5X} \Rightarrow 0.01 = \frac{2X}{100+2X} \Rightarrow 1+0.02X = 2X$

$1 = 1.98X \Rightarrow X = 0.$

3% solution

$0.03 = \frac{X}{100+X} \Rightarrow 0.03 = \frac{0.5X}{100+2X} \Rightarrow 3+0.06X = 0.5X \Rightarrow 3 = 0.44X$

$X = 1.55\,g$

7% PEO MW 400K 1000 rpm thickness ~ 10 μm

7% PEO MW 400K 750 rpm thickness ~ 13 μm

Use these to coat wafers during grit blast protection

Blank wafers w/ Liquinox

~5% Z-6032 solution applied, air 2 minutes

spin 1500 rpm 1 minute

bake 100°C 5 minutes

Sample 4 Ed

① Liquinox TCB cure, wash

② Liquinox (blanket) 3% silane layer, 2 min air, spin 1200 rpm 1 minute, 65°C bake 2 minute

③ Liquinox (patterned) 5% silane layer, 2 min air spin 1500 rpm 1 min, 110°C bake 5 minutes, wash

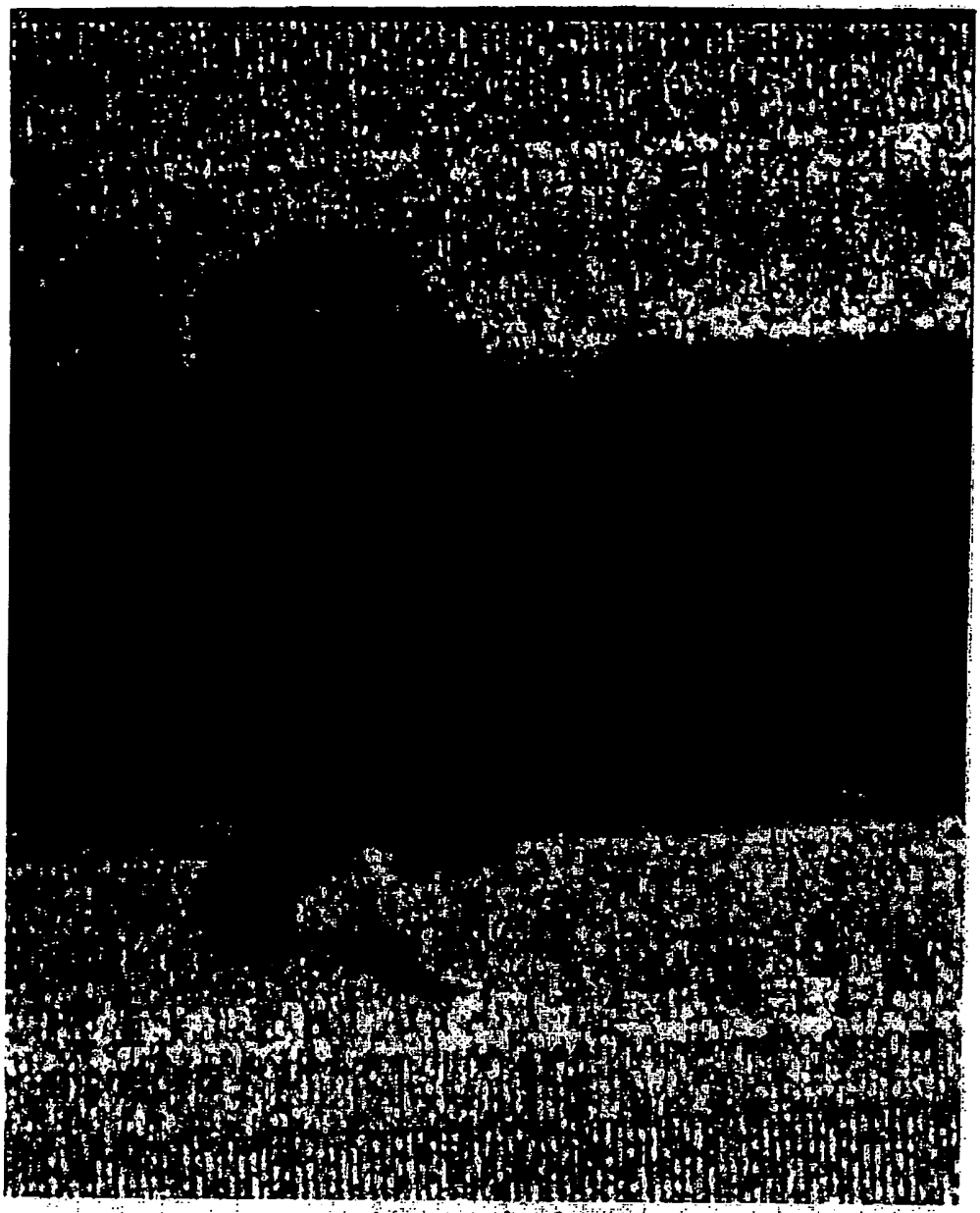


Fig. 1

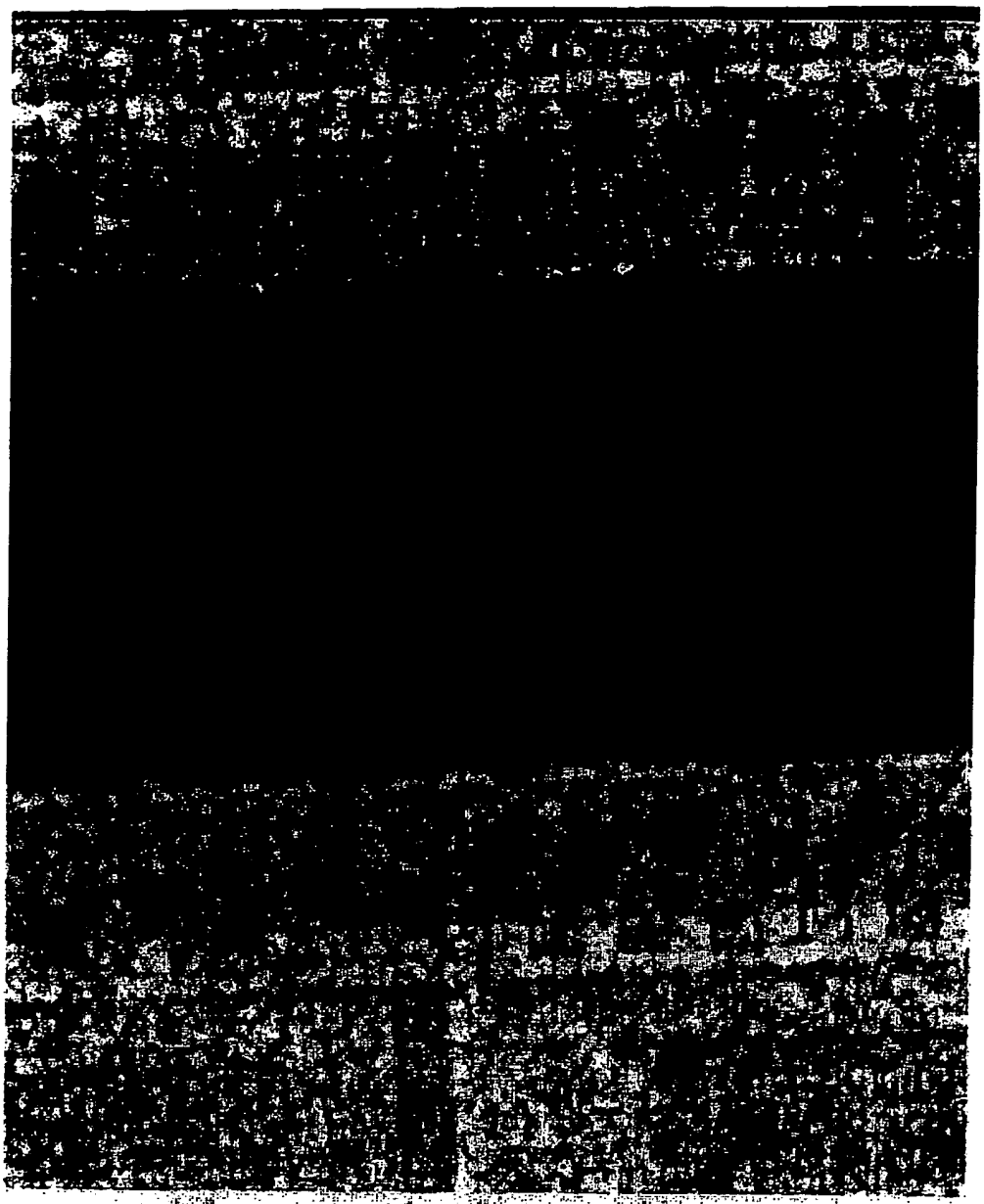


Fig. 2

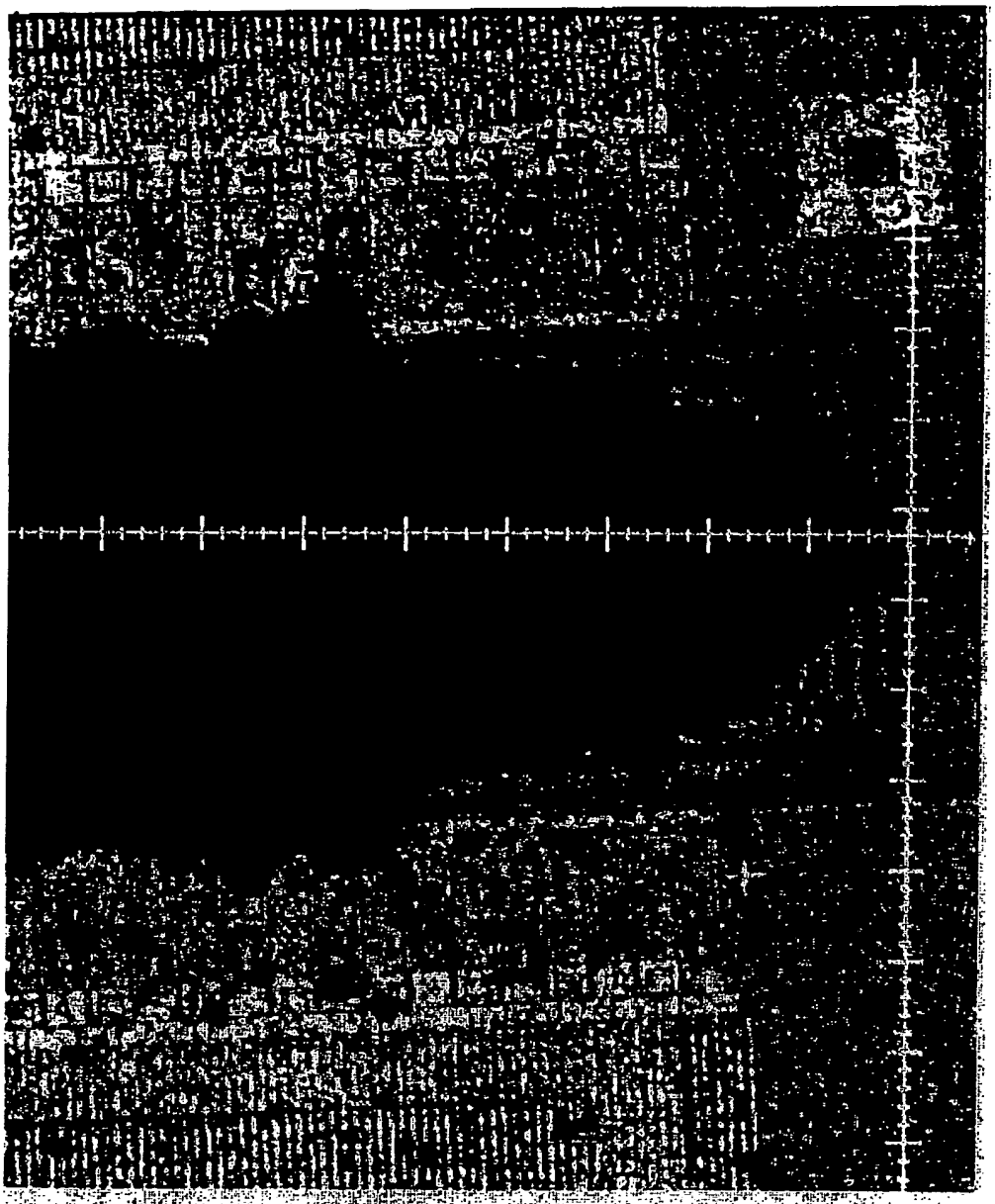
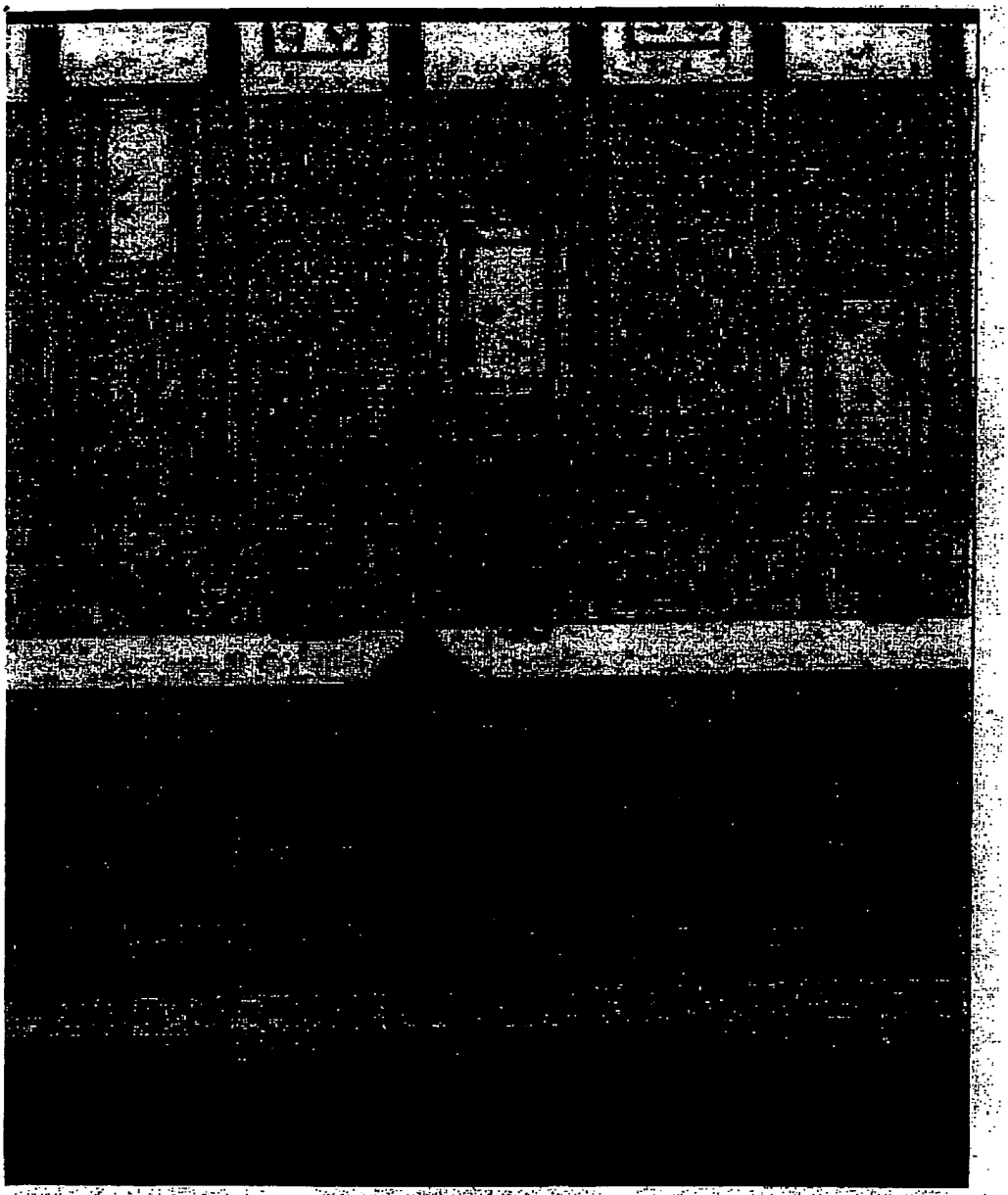


Fig. 3



Maple chips 7% PEO coating after grit bl
RIE Run #1 washed

Fig. 4